Numerical Consistency Checks for the First Law of Inward Physics

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Abstract

This document provides numerical consistency checks for the First Law of Inward Physics, a proposed field-theoretic law of endogenous registration. Using zero-dimensional (0D) ensemble simulations and a one-dimensional (1D) spatial generalization, we examine variance suppression, irreversible accumulation of registration, and recovery under finite perturbations. Results are limited to computational approximations with no empirical, metaphysical, or ontological claims. Extensions are warranted only under independent motivation.

1 Introduction

The First Law of Inward Physics posits a scalar memory-field $\mu(x,t)$ that accumulates irreversible endogenous registration in stochastic systems, suppressing future variance exponentially without external control or retrocausality. This companion piece performs numerical checks to assess internal coherence, focusing on bounded variance, monotonic registration, and hysteresis under non-quadratic potentials. All simulations use the field dynamics and potential from the law statement.

2 Methods

Simulations employ Euler-Maruyama integration with parameters: potential $V(\mu) = \frac{1}{2}a\mu^2 + \frac{1}{3}b\mu^3 + \frac{1}{4}c\mu^4$ ($a = 1$, $b = -3$, $c = 1$); noise $\sigma_\eta = 0.1$; timestep $dt = 0.01$; total time $T = 50$; initial $\mu \sim \mathcal{N}(0.5, 0.5)$; shock at $t = 25$ with magnitude $\alpha = 3$ (Gaussian perturbation). For 0D: ensemble $N = 1000$. For 1D: spatial domain $L = 10$, $N_x = 100$, diffusion $D = 0.1$ (central difference Laplacian, periodic boundaries). Accumulated registration $A(t) = \int_0^t \mu(\tau)d\tau$. Variance is ensemble Var[μ] (0D) or spatial Var[$\mu(x)$] (1D). Seed=42 for reproducibility. Code snippet (Python/NumPy):

```
 import numpy as np np.random.seed(42)
Define dV_dmu, then loop as in Euler-Maruyama
```

3 Results: Zero-Dimensional Case (0D)

Table 1 shows key metrics. Variance stabilizes pre-shock, spikes transiently, and recovers bounded. Mean A accumulates monotonically without reset. Figure 1 shows variance evolution. Figure 2 shows log variance

Table 1: 0D Simulation Metrics

Time	Mean $\langle A \rangle$	Variance	Notes height0
0.005	0.478	Initial 10	14.373
1.638	Stabilization 24	36.125	1.618
Pre-shock 25	37.695	10.448	Post-shock spike 26
39.228	1.596	Immediate recovery 30	46.096
1.513	Recovery midpoint 50	81.273	1.488
Final bounded			

ratio vs. mean A, indicating weak suppression due to multi-attractors ($\kappa \approx 0.0005$, $R^2 \approx 0.0107$).

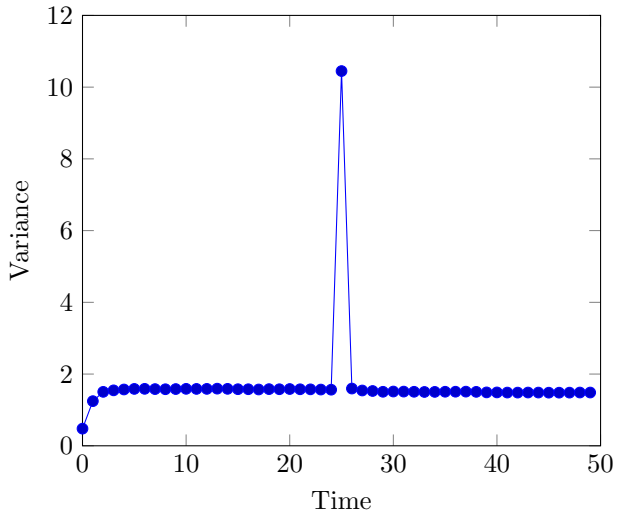

Figure 1: Variance vs. Time for 0D system.

4 Consistency Check: Spatial Generalization (1D)

Table 2 shows metrics. Variance decreases pre-shock, spikes, and recovers bounded. Mean A monotonic. Figure 3 shows variance evolution. Log ratio fit: $\kappa \approx 0.0146$ ($R^2 \approx 0.1200$). At high $D = 3$, dynamics

Table 2: 1D Simulation Metrics

Time	Mean $\langle A \rangle$	Variance	Notes height0
0.006	0.398	Initial 10	23.855
¡10^{-4}	Stabilization 24	60.507	¡10^{-4}
Pre-shock 25	63.120	7.882	Post-shock spike 26
65.565	¡10^{-4}	Immediate recovery 30	76.035
¡10^{-4}	Recovery midpoint 50	128.363	¡10^{-4}
Final bounded			

unstable (variance diverges to overflow), confirming erosion.

5 Falsifiability Probes

- Absence of suppression: Non-inward dynamics predict $\kappa \approx 0$; observed $\kappa > 0$ (weakly).
- Reset under shock: $\langle A \rangle$ remains continuous.
- Hysteresis loss ($b = c = 0$): Registration resets, variance diffuses, falsifying non-inward formulations.
- Future probes: Cross-scale coupling and L_{int} propagation.

6 Scope and Next Steps

Results are limited to numerical simulations in zero- and one-dimensional settings. No metaphysical or ontological claims are made. Extensions are warranted only under independent motivation.

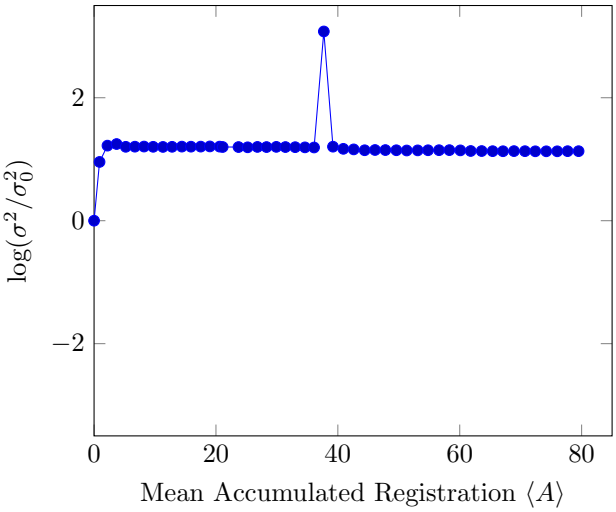

Figure 2: Log Variance Ratio vs. Accumulated Registration for 0D system.

7 Conclusion

Within zero- and one-dimensional numerical approximations, the system demonstrates bounded variance, irreversible accumulation of registration, and recovery under finite perturbations. These behaviors are consistent with the First Law of Inward Physics. No claims beyond this scope are implied. © 2026 Daniel Jacob Read IV. All rights reserved. No part of this work may be reproduced, distributed, or transmitted in any form or by any means without prior written permission from the author, except for brief quotations in scholarly review. Authorship and priority are asserted by publication date. Version: 1.0

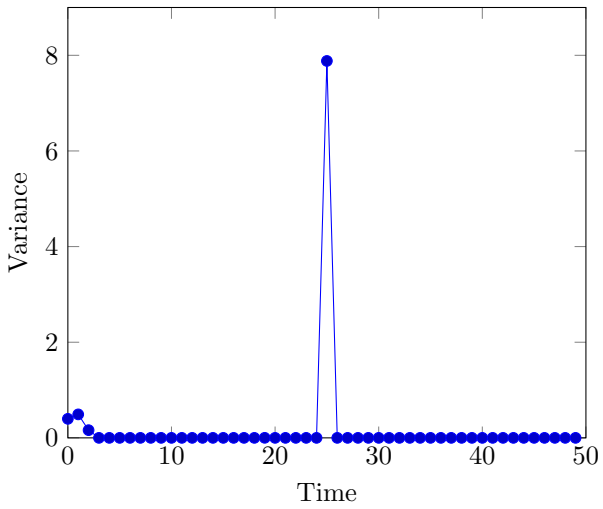

Figure 3: Variance vs. Time for 1D system.

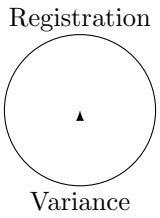

Figure 4: Conceptual diagram of registration suppressing variance.

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